

Special-Status Plant Technical Report for Crystal Mountain Master Development Plan

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Special-Status Plant Technical Report for Crystal Mountain Master Development Plan

ACS Disclaimer

On March 22, 2004, the Northwest Forest Plan was amended to change the documentation requirements with regard to the Aquatic Conservation Strategy (ACS). The March 2004 amendment clarified that the nine objectives of the ACS apply only at the fifth-field watershed and larger scales (USDA, USDI, 2004a). The ACS objectives are not to be interpreted as standards and guidelines applicable to individual projects, such as Crystal Mountain MDP. Projects are to be consistent with all standards and guidelines of the Forest Plan, as Amended (including standards and guidelines for Riparian Reserves); projects are also to be designed to contribute to maintaining or restoring the fifth-field watershed over the long-term, even if short-term effects may be adverse. Refer to FEIS, Section 1.2.1.4. While portions of the analysis documented in the FEIS have been adjusted to comply with current direction, particularly regarding consistency with Riparian Reserve standards and guidelines, this appendix was prepared earlier, to comply with requirements in effect prior to March 22, 2004.

Survey and Manage Disclaimer

On March 22, 2004, the Northwest Forest Plan was also amended to remove in their entirety the Survey and Manage Mitigation Measure Standards and Guidelines. The text in this appendix reflects that the Crystal Mountain MDP fully complied with the Survey and Manage direction that existed prior to March 22, 2004. The FEIS complies with the direction provided in the March 22, 2004 Northwest Forest Plan amendment for Survey and Manage species Mitigation Measure Standards and Guidelines, and existing Special Status Species Policies. No additional survey work is required (USDA, USDI, 2004b).

1 EXECUTIVE SUMMARY

1.1 Purpose of this Report

This special-status plant report was prepared for the U.S. Forest Service (USFS) as part of the inventory of natural resources associated with the Crystal Mountain, Inc. Master Development Plan (MDP). The MDP is a long-range management and development plan proposing additional ski trails and facilities for the ski area. Crystal Mountain ski area is located on the Mt. Baker-Snoqualmie National Forest (MBSNF) east of Mt. Rainier National Park. Crystal Mountain operates the ski area under a Special Use Permit (SUP) administered by the MBSNF.

Because Crystal Mountain operates the ski area on lands within the MBSNF, all proposed projects must comply with the MBSNF plans and policies relative to sensitive plants. These include (1) the USFS policy to manage and maintain viable populations of USFS sensitive plants (USFS 1999) and (2) the MBSNF Land and Resource Management Plan as amended by the

Northwest Forest Plan which identifies standards and guidelines that will provide benefits for Survey and Manage and Protection Buffer plant species associated with old-growth forest (USFS and USBLM 1994; USFS 1990).

Since the Northwest Forest Plan and associated Record of Decision were published, the USFS and U.S. Bureau of Land Management (USBLM) have issued an amendment for Survey and Manage and Protection Buffer species (USFS and USBLM 2000). The Record of Decision for the amendment provides current management strategies for Survey and Manage species (USFS and USBLM 2001) as reviewed and amended in 2002 (USFS and USBLM 2002).

The purpose of this report is to document the actions Crystal Mountain has taken to (1) comply with the MBSNF plant program for USFS sensitive plants, (2) determine the presence or absence of Survey and Manage plant species as described in *the Record of Decision for Amendments to the Survey and Manage Protection Buffer, and Other Mitigation Measures Standards and Guidelines* (USFS and USBLM 2001), and (3) determine the presence of any other federal or state-listed threatened or endangered plant species. The report presents the study methods and results of prefield and field investigations to identify sensitive vascular plants, Survey and Manage plant species, and other threatened or endangered plant species. The report will be referenced in the NEPA document prepared for the MDP.

1.2 Summary of Study Methods and Findings

Surveys were conducted for sensitive and Survey and Manage vascular plants (ferns and herbaceous flowering plants) and for nonvascular (lichens, bryophytes, and fungi) Survey and Manage plant species. Surveys were conducted at the proposed MDP project areas in which ground disturbance would occur, using survey protocol approved by the USFS and USBLM. Surveys were conducted during summer field seasons in 1996, 1997, 1998, 1999, 2000, 2001, and 2002 by botanists familiar with survey protocol. Field surveys for vascular plant species were conducted in a variety of forested and nonforested plant communities. Field surveys for nonvascular plant species were conducted primarily in conifer forests dominated by western hemlock, Pacific silver fir, mountain hemlock, and subalpine fir.

Survey and Manage vascular plant species, lichen, or fungi species with approved survey protocol were not observed to be present in proposed MDP project areas during field surveys. Surveys included those for *Sarcosoma mexicana*, a Survey and Manage fungi species, following survey protocol developed by the USFS and USBLM (O'Dell, 1999). Survey protocol for *S. mexicana* has since changed (USFS and USBLM 2001) and predisturbance surveys are no longer required. Field surveys did confirm the presence of the previously documented occurrence of *Tholurna dissimilis* (a lichen) in the vicinity of the Summit House on Crystal Mountain but outside of the proposed Summit House expansion and retreat center construction areas. However, since *Tholurna dissimilis* was observed near the Summit House during field surveys for the proposed MDP projects, the species has been removed from the Survey and Manage list for areas north of the Columbia River (USFS and USBLM 2001). *Rhizomnium nudum*, a moss previously considered a Survey and Manage species in Washington, was observed in forested habitat where Trail 15F (Bullion Basin ski trail) and Trail 12A (Park n' Ride ski trail) are proposed, as well as in various sites across the SUP area and outside proposed MDP project sites.

R. nudum was recently removed from the Survey and Manage list in the second annual review for Survey and Manage species (USFS and USBLM 2003).

No federally listed threatened, endangered, or candidate plant species were observed to occur in the survey area. USFS Region 6 sensitive plant species observed in the SUP area included *Botrychium ascendens*, *Carex atrata* var. *erecta*, and *Pedicularis rainierensis*. *Pedicularis rainierensis* was the only USFS sensitive plant species observed growing within proposed MDP project sites. Over 10,000 individual plants of this species were observed and the proposed MDP would not affect 90% of these plants.

Botrychium minganense was also observed in the SUP area, but outside of the proposed MDP project sites. This species was recently delisted from the USFS Regional Forester's sensitive species list and the USFS and USBLM Survey and Manage plant list (USFS and USBLM 2001).

2 INTRODUCTION

Crystal Mountain, Inc. has presented a Master Development Plan (MDP) to the Mt. Baker-Snoqualmie National Forest (MBSNF) that describes long-range (10 to 15 years) management and development plans for the Crystal Mountain Ski Area (Sno. engineering 1998). The ski area operates under a Special Use Permit (SUP) administered by the MBSNF. Implementation of the MDP cannot occur until a NEPA review of the proposed actions is complete.

As part of that process, the MDP will be reviewed by the MBSNF to ensure compliance with the MBSNF land management plans and policies relative to special-status plants. This includes compliance with:

- USFS policy to manage and maintain viable populations of USFS sensitive plants (1999). Some species on the USFS sensitive plant list are considered by the USFS to be sensitive in Oregon but not Washington and vice versa. In this report, if a species is referred to as “sensitive” by the USFS, it is assumed that the species is considered sensitive in Washington.
- The MBSNF Land and Resource Management Plan as amended by the Northwest Forest Plan which identifies standards and guidelines that will provide benefits for Survey and Manage plant species and Protection Buffer species associated with old-growth forest (USFS and USBLM 1994; USFS 1990).
- *The Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines* (USFS and USBLM 2001), as reviewed and amended in 2002 (USFS and USBLM 2002).

For the purpose of this report, special-status plant species include those plants listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (50CFR 17.12); candidates for possible future listing as threatened or endangered (67 FR 40657, June 13, 2002); plants listed on the USFS Regional Forester’s sensitive species list (USFS 1999); vascular plants considered endangered, threatened, or sensitive by the Washington Natural Heritage Program (WNHP 1997); and vascular and nonvascular plants known as “Survey and Manage” species as described in the *Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines* (USFS and USBLM 2001), as reviewed and amended in 2002 (USFS and USBLM 2002).

Survey and Manage plant species include both vascular species (e.g., ferns and herbaceous flowering plants) and nonvascular plants (lichens, liverworts, mosses, and fungi). Survey and Manage plant species that would be subject to review for the MDP include (1) those species that are known to exist near proposed projects where ground disturbance would occur, and (2) those species for which field surveys (per USFS and USBLM approved survey protocol) are to be conducted in specified project areas before ground-disturbing activities occur. Sensitive vascular plant species are identified on the Regional Forester’s sensitive plant list (USFS 1999).

(Some Survey and Manage species described in this report were originally considered Protection Buffer species in the 1994 Northwest Forest Plan. However, to be consistent with current terminology, these species are all now considered Survey and Manage species.)

2.1 Purpose of Report

The purpose of this report is to document the actions Crystal Mountain has undertaken to identify special-status plant species within project areas proposed in the MDP. As described below, the report presents the study methods and results of prefield and field investigation to identify USFS sensitive species (which includes any potential federally listed threatened or endangered plant species) and Survey and Manage plant species. This special-status plant technical report will be referenced in the NEPA document prepared for the MDP.

This report includes botanical information collected from surveys conducted during the 1996, 1997, 1998, 1999, 2000, 2001, and 2002 field seasons to review MDP project areas and other Crystal Mountain projects. The information is included to provide a full disclosure of botanical resources and to analyze the effects of the MDP relative to all known USFS sensitive plants and Survey and Manage plants in the SUP area.

2.2 Summary of Project Description

The proposed MDP includes the replacement and addition of chairlifts and surface lifts, development of new ski trails, reestablishment of previously developed ski trails in Bullion Basin, construction of an aerial tram from the base area to the top of Crystal Mountain, expansion of the snowmaking system, construction of additional parking areas, construction of new overnight lodging facilities and employee housing facilities, construction of additional restaurant facilities on the mountain area of the SUP, and utilities to support new ski and other recreational opportunities.

2.3 Project Setting

The Crystal Mountain SUP area is located on the MBSNF east of Mt. Rainier National Park, sharing a boundary with the park along the west side of the SUP area (Figure 1). The ski area is at the south end of Crystal Mountain Boulevard where the road ends at the base area parking lots and lodge facilities. The SUP area is approximately 4,500 acres situated at the head of the Silver Creek watershed with maintained skiable terrain on the western, southern, and lower portions of the eastern slopes that make up the Crystal Mountain basin.

Elevations in the Crystal Mountain SUP area range from 3,900 feet to 7,002 feet above sea level. Although annual precipitation has not been recorded for the specific area, National Weather Service maps indicate a mean annual precipitation in the Crystal Mountain area to be slightly over 100 inches (Franklin and Dyrness 1973). Crystal Mountain reports average annual snowfall to be 338 inches. Precipitation is estimated to be approximately 60 inches per year when one considers factors such as average snowfall amounts, vegetation conditions in the watershed (e.g., scattered occurrences of ponderosa pine and whitebark pine), precipitation amounts in surrounding areas, and the concept of a Mt. Rainier rain shadow in the ski area (Jones & Stokes Associates 1997).

Vegetation in the SUP area is dominated by forested vegetation types, including immature (less than 80 years old) forests dominated by, in order of increasing elevation, Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), Pacific silver fir (*Abies amabilis*), mountain hemlock (*Tsuga mertensiana*), and subalpine fir (*Abies lasiocarpa*). Noble fir (*Abies procera*) is also present as a subdominant in the lower Pacific silver fir forests. Mature forests make up approximately 37% of the forested vegetation and are dominated by western hemlock, Pacific silver fir, mountain hemlock, or subalpine fir. Subalpine fir parkland and open herbaceous mountain slopes and meadows are common above 5,500 feet.

3 STUDY METHODS

The study approach to determining the presence of special-status plant species included consulting with MBSNF botanists, reviewing the USFS database of Survey and Manage species, and conducting field surveys. The study method is described below.

3.1 Established Agency Survey Protocol

As stated in Section 2 (Introduction), the Northwest Forest Plan identifies vascular and nonvascular plant species for which surveys are to be completed for projects where ground-disturbing activities may be implemented on or after October 1, 1998. Consistent with the MBSNF Land and Resource Management Plan as amended by the Northwest Forest Plan (and subsequent amendments to Survey and Manage species [USFS and USBLM 2001, 2002]), the MBSNF has recommended surveys for those Survey and Manage plant species for which the Regional Ecosystem Office has officially approved survey protocols (Potash pers. comm.).

As of December 1998, survey protocols had been developed for three lichen species, five liverwort species, one fungus, and 15 vascular plant species (USFS and USBLM 1997, 1998; Hibler and O'Dell 1998; Whiteaker et al. 1998). Field survey techniques were consistent with the approved protocol. As discussed below, comprehensive floristic field surveys for sensitive vascular plants were conducted, listing all species observed.

In December 1999, survey protocol had been developed for an additional seven fungi species and six bryophyte species considered Protection Buffer species (at that time) in the Northwest Forest Plan (O'Dell 1999, USFS and USBLM 1999a). The USFS and USBLM also issued a *Draft and Final Supplemental Environmental Impact Statement for Amendment to the Survey and Manage, Protection Buffer, and Other Mitigating Measures Standards and Guidelines* (USFS and USBLM 1999, 2000) that reassigned survey requirements and status of the Survey and Manage and Protection Buffer plant species as originally described in the Northwest Forest Plan (USFS and USBLM 1994). Guidance to conduct field surveys for the additional fungi and bryophytes are based on the protocol and the Record of Decision for the Final EIS (USFS and USBLM 2001). In June 2002, the USFS and USBLM issued a memorandum (USFS and USBLM 2002) implementing the 2001 Survey and Manage Annual Species Review revisions to category placement for species displayed in Table 1-1 of the 2001 Survey and Manage ROD.

See Table 1 below for the lichen, liverwort, moss, fungi, and vascular plant species currently listed as Survey and Manage species with approved survey protocol (2002 Survey and Manage list) that are known or have the potential to occur on the MBSNF. *Allotropa virgata* and *Botrychium minganense* were included in this list when field surveys were first initiated in 1996 but have since been removed (USFS and USBLM 2001). *Schistostega pennata* and *Tetraphis geniculata* have been included with approved predisturbance survey protocols (USFS and USBLM 2001). *Sarcosoma mexicana*, a Survey and Manage species with approved survey protocol that was surveyed for, has since been removed from the Survey and Manage list (USFS and USBLM 2002).

Table 1
LICHENS, LIVERWORTS, MOSSES, FUNGI, AND VASCULAR SURVEY AND MANAGE
PLANT SPECIES WITH APPROVED SURVEY PROTOCOL KNOWN
OR POSSIBLY SUSPECTED TO OCCUR ON THE MBSNF

Scientific Name	Common Name
Lichens	
<i>Hypogymnia duplicata</i>	--
<i>Lobaria linita</i>	--
<i>Pseudocyphellaria rainierensis</i>	--
Liverworts	
<i>Diplophyllum plicatum</i>	--
<i>Kurzia makinoana</i>	--
<i>Tritomaria exsectiformis</i>	--
Mosses	
<i>Schistostega pennata</i>	--
<i>Tetraphis geniculata</i>	--
Fungi	
<i>Bridgeoporus (=Oxyporus) nobilissimus</i>	Noble polypore
Vascular Plants	
<i>Botrychium montanum</i>	Mountain grape-fern
<i>Coptis asplenifolia</i>	Spleenwort-leaved goldthread
<i>Coptis trifolia</i>	threeleaf goldthread
<i>Cypripedium fasciculatum</i>	Clustered lady's-slipper
<i>Cypripedium montanum</i>	Mountain lady's-slipper
<i>Eucephalus vialis</i>	wayside aster
<i>Galium kamtschaticum</i>	Boreal bedstraw
<i>Platanthera orbiculata</i>	Round-leaved bog-orchid
Sources: Potash pers. comm., Whiteaker et al. 1998.	

3.2 Prefield Review and Consultation with MBSNF

USFS survey protocols for vascular plants, lichen, bryophyte, and fungi species specify a trigger for implementing field surveys if ground disturbance or indirect impacts are expected and:

- the species is known to occur in the proposed project area;
- the species is known to occur in the immediate vicinity of the proposed project; or
- the species is suspected to occur in the proposed project area because it is within the known or suspected range.

Consultation with MBSNF botanists, forest ecologists, and bryologists was initiated to identify those Survey and Manage species with survey protocol that could occur in the proposed project areas of the MDP. Consultation with MBSNF also included a request for a search of the MBSNF database for Survey and Manage plant species known to exist in the SUP and immediate areas (USFS 1998 Survey and Manage Component 1 Interim Database Version 2.0). The MBSNF was also consulted after the 1999 Draft Supplemental EIS was issued to determine field survey requirements based on the proposed reassignment of survey status for many of the fungi and bryophyte species with survey protocol (USFS and USBLM 1999b).

A prefield review of existing information and references for USFS sensitive species was also conducted for the SUP area.

3.3 Field Methods

Field methods were based on the survey protocol for vascular and nonvascular plants. Level 5, intuitive controlled, field surveys were used to identify vascular plant species as described in the standard operations for plant survey program for the MBSNF.

A comprehensive floristic survey was completed, and a species list of all vascular plants identified in a study area was submitted to the MBSNF. Therefore, all listed Survey and Manage and USFS sensitive vascular plant species were included as target species during field work. USFS daily botanical survey forms, maps, and MBSNF sensitive plant survey forms were completed and submitted to the MBSNF for all vascular plant surveys.

Lichen surveys included observing the boles of trees, branches on the tree, and downed branches and litter fall on the ground around the base of trees. In some cases, binoculars were used to examine tree boles. Bryophyte surveys included inspection of downed logs and root wads, examination of stream banks, and collection of material from rock, mineral soil, and decaying wood, and keying of collected specimens in the laboratory using a compound microscope. Surveys for *Sarcosoma mexicana* (Survey and Manage fungus species recently removed from the list) included collecting specimens of mushroom species that were similar in appearance to *Sarcosoma* and observing spore prints to assist with species identification.

3.4 Survey Areas

Field surveys for sensitive vascular plants were conducted in proposed project areas defined in the MDP, the North and South Country areas, alternative MDP project areas previously considered but eliminated from consideration, and other Crystal Mountain project areas reviewed under NEPA processes that are separate from the MDP.

Surveys for nonvascular plants were conducted in potential habitat within the proposed MDP project areas. The specific sites are described in Section 4 (Study Results).

3.5 Survey Dates

Surveys for vascular plant species were conducted on the following dates: August 8-10, 14-16, 22-26, 28-31, September 1-5, 1996; August 13-22, 1997; and July 22-24, 27-29, August 24, 1998. Surveys for Survey and Manage lichen species were conducted on July 22-24, July 28, August 24, October 13, November 5 and 17, 1998, and September 7, 1999. Bryophyte surveys were conducted on November 5, 1998; September 18 and October 19, 2000; September 14, 19, and 25, 2001; and July 15-18 and August 20, 2002. Surveys for *Sarcosoma mexicana* were conducted May 15, 16, 25, and 26; June 6, 7, 21, 22, and 25; July 5 and 19; and August 4, 2000. Surveys for this fungus species were scheduled to coincide with snowmelt in the different project areas at different elevations.

3.6 Survey Personnel

Vascular plant surveys were coordinated by Jones & Stokes and conducted by botanists from Jones & Stokes, Calypso Consulting, and the MBSNF (during 1996 only).

Lichen surveys were conducted by Jones & Stokes botanists who have attended field training sessions sponsored by MBSNF, conducted surveys for other projects within the MBSNF, observed the lichens in representative habitat locations on the MBSNF, or identified collected specimens of the Survey and Manage lichen species. MBSNF botanists also participated in surveys for one of the lichen species, *Tholurna dissimilis*.

Bryophyte surveys were conducted by Jones & Stokes botanists, a USFS botanist, and a bryologist recommended by the MBSNF as an individual with the required qualifications and skills to identify the species of concern. Surveys for fungus species were conducted by Jones & Stokes biologists who had observed specimens of *Sarcosoma mexicana* collected by USFS botanists.

4 STUDY RESULTS

4.1 Prefield Consultation and Data Review

The prefield review for USFS sensitive plant species determined the following species are known from the general vicinity of the SUP area: *Botrychium lunaria*, *Chaenactis thompsonii*, and *Pedicularis rainierensis*.

The Survey and Manage database search indicated that *Tholurna dissimilis*, a lichen species, has been observed on an Engelmann spruce tree near the Summit House Restaurant. The MBSNF Land and Resource Management Plan as amended by the Northwest Forest Plan states that management of known Survey and Manage species sites should be implemented. Surveys for this lichen species were required because of its location near a proposed project (expansion of the Summit House and construction of the Summit Retreat Center). However, since the surveys were conducted, this species has been removed from the Survey and Manage species list for Washington (USFS and USBLM 2001). No other known Survey and Manage species were reported to occur in the SUP area. At the time surveys were first initiated in 1996, the next closest location of a Survey and Manage species identified in the search was candystick (*Alloiropa virgata*) located approximately 4 miles north of the SUP area. *A. virgata* has since been removed from the Survey and Manage list (USFS and USBLM 2001).

Consultation with MBSNF botanists and forest ecologists determined that *Lobaria linita* would not be expected to occur at Crystal Mountain ski area because of the lack of wet, old-growth forest (Lescher pers. comm.). *Hypogymnia duplicata* and *Pseudocyphellaria rainierensis* are unlikely to occur in the proposed project areas because of the lack of moist, old-growth forest, but their presence cannot be completely ruled out (Lescher pers. comm.; Potash pers. comm.). Because of the potential for the presence of two of the lichen species, MBSNF recommended surveys for lichens in proposed project areas with mature forests dominated by western hemlock, Pacific silver fir, or mountain hemlock (Potash pers. comm.).

Consultation with the MBSNF botanist determined liverwort surveys were not required for *Diplophylum plicatum* and *Kurzia makinoana* because of the lack of suitable habitat (Potash pers. comm.). The MBSNF has determined that *Tritomaria exsectiformis*, a species known only from the Deschutes National Forest in Oregon, may have a remote possibility of occurring on the driest sites of the MBSNF (Harpel pers. comm.). Surveys for this species were recommended for proposed projects in the drier portion of potential habitat along the Bullion Basin/East Peak areas east of Crystal Mountain Boulevard (Potash pers. comm.).

Hypogymnia duplicata, *Pseudocyphellaria rainierensis*, and *Tritomaria exsectiformis* were the nonvascular plant species with approved protocols that were targeted as species with the potential to occur in the proposed MDP project areas. Because field methods for these species required physical observation of trunks, branches, litter, rock surfaces, etc. where other Survey and Manage species could occur, surveys for essentially all potential Survey and Manage nonvascular plant species with developed protocol were conducted in the surveyed areas.

Consultation with the USFS determined field survey requirements for six Survey and Manage bryophyte and seven fungi species (formerly considered Protection Buffer species in the Northwest Forest Plan) would be based on the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USFS and USBLM 2001). Based on this Record of Decision, additional surveys for two bryophyte species, *Schistostega pennata* and *Tetraphis geniculata*, were conducted during summer 2001 where potential habitat exists in proposed project areas. Surveys for the remaining four bryophyte species and the seven fungi species would not be conducted as these species are now categorized as Category B (predisturbance surveys not practical), Category D (predisturbance surveys not practical or not necessary), or Categories E and F (status undetermined) (USFS and USBLM 2001).

4.2 Field Surveys

Because of the sensitive nature regarding USFS management to maintain the viability of special-status plant species, their locations and specific population sizes are not included in this document. Locations of sensitive plants have been submitted to the MBSNF botanist.

4.2.1 U.S. Forest Service Sensitive Vascular Plants

A total of 410 species of vascular plants were observed within areas surveyed at Crystal Mountain. Of the 410 species observed, three are recognized as sensitive by the USFS: *Botrychium ascendens*, *Carex atrata* var. *erecta*, and *Pedicularis rainierensis*. These species occurrences in the SUP area are discussed below.

4.2.1.1 *Botrychium ascendens*

One location was found at an elevation of approximately 4,680 feet in a riparian area. The plants were in a relatively open area dominated by a mix of shrub vegetation including willow (*Salix* sp.), huckleberry (*Vaccinium* spp.), and scattered subalpine fir and Pacific silver fir. The plants are located in an area that will not be affected by the MDP.

4.2.1.2 *Carex heteroneura* (formerly known as *C. atrata* var. *erecta*)

Several locations were identified in the North Country within natural openings in the subalpine fir and Pacific silver fir forests. The sedge species is commonly associated with wetlands and open wet meadow areas above 5,000 feet. The species has also been reported to occur along the Silver Creek area north of the SUP area at elevations of approximately 3,800 feet. The species' viability is not expected to be affected by any of the proposed MDP project elements. Sensitive plant survey forms for this species were not completed because the species was listed as a USFS sensitive species after the surveys were conducted.

4.2.1.3 *Pedicularis rainierensis*

Numerous locations were found within the SUP area throughout the subalpine fir parkland and subalpine herbaceous plant communities. The plants were located at a range of elevations from approximately 5,400 to 6,500 feet and were scattered throughout the SUP area. The largest groups of plants contained over several thousand individuals; smaller locations have less than

100 individuals. As discussed in Section 5 (Determination of Effects), several locations are found in proposed MDP project areas.

4.2.2 Vascular Plant Species Reported as Sensitive by Other Agencies

No federal endangered, threatened, or candidate plant species or state endangered or threatened species were found in the project area. In addition to the three USFS sensitive plant species observed, three additional plant species, recognized by the Washington Natural Heritage Program (WNHP) at the time surveys were conducted, were identified: *Botrychium minganense*, *Botrychium pinnatum*, and *Botrychium simplex*. Both *B. pinnatum* and *B. simplex* have since been removed from the WNHP list. *B. minganense* was considered a Survey and Manage plant species by the USFS (USFS and USBLM 1994), but it has been removed from the Survey and Manage list for the state of Washington (USFS and USBLM 2001). Several locations of the three species were found in naturally occurring openings in the forest or in areas cleared of forest and maintained as open ski trails. None of the species would be affected by proposed MDP projects because they do not occur in areas proposed for MDP projects.

4.2.3 Survey and Manage Species

Survey and Manage vascular plant species were not observed within proposed MDP project sites. As previously mentioned, several occurrences of *B. minganense*, a fern species previously considered a Survey and Manage species, are present in the SUP area outside of the limits of the proposed MDP project sites. These occurrences were previously reported to the MBSNF as required by the MBSNF plant program when the species was listed as a sensitive and Survey and Manage species.

Field surveys confirmed the presence of the previously documented occurrence of *Tholurna dissimilis*, a lichen, in the vicinity of the Summit House (but outside of the proposed Summit House expansion and retreat center construction areas). However, as previously noted, *Tholurna dissimilis* has been removed from the Survey and Manage list north of the Columbia River. *Rhizomnium nudum*, a moss previously listed as a Survey and Manage species, was observed in forested habitat where Trail 15F (Bullion Basin ski trail) and Trail 12A (Park n' Ride ski trail) are proposed, as well as various sites in the SUP area outside of proposed MDP project areas.

Detailed results of surveys for nonvascular plants, including bryophytes (liverworts and mosses), lichens, and fungi, are described below.

4.2.3.1 Bryophytes (Liverworts and Mosses)

No Survey and Manage liverwort species specific to old-growth forest in Washington were observed during the surveys. A list of the species identified by the bryologist who conducted the surveys is included in Appendix A.

Areas where liverwort surveys were conducted and their habitat conditions are as follows:

- Small scrub-shrub wetland that is dominated by Sitka alder (*Alnus sinuata*) and foamflower (*Tiarella trifoliata*) in the Bullion Basin ski area where Trail 15A (as proposed in the MDP) intersects the Mine to Market Road at an approximate elevation of 4,700 feet.
- Proposed crossover Trail 15F in the Bullion Basin ski area. This proposed trail is in an immature forest dominated by western hemlock, Pacific silver fir, and Douglas fir with scattered Alaska cedar (*Chamaecyparis nootkatensis*) and a sparse understory of huckleberry (*Vaccinium* spp.) and queen's cup (*Clintonia uniflora*). Tree size for the small, thick understory saplings and poles ranges from 3 to 8 inches diameter breast height (dbh) with overstory trees generally ranging from 8 to 16 inches dbh. Elevations range from approximately 4,650 to 4,800 feet. The survey area included stream banks of Bullion Basin Creek where the proposed crossover Trail 15F crosses the creek.
- Proposed base terminal area of the East Peak chairlift (elevation approximately 4,650 feet) where a small area of mature, scattered western hemlock and Douglas fir trees (ranging in size from 20 to 36 inches dbh) and younger Pacific silver fir and western hemlock trees ranging in size from approximately 4 to 16 inches dbh occur. An avalanche in February 1999 bent younger understory trees over and stripped them of needles and some branches, but the larger mature overstory trees were generally not affected in the area where Trail 15F would meet the lower terminal area.
- Nonmaintained, cleared ski trail along the existing Trail 15D in Bullion Basin ski area where a small intermittent creek spills over its banks from Bullion Basin Creek during most spring and summer months. Survey location was along the banks of the intermittent creek at an approximate elevation of 4,900 feet.
- Proposed Trail 12A and the lower portions of the proposed Kelly's Gap chairlift west of the existing base area. Elevations of the survey area range from 4,275 feet to 4,550. This area is considered closed, immature forest dominated by Pacific silver fir and western hemlock ranging in size from 6 to 18 inches dbh; larger western hemlock trees up to 24 inches dbh are scattered throughout the area. The understory is relatively dry and vegetation is very sparse with scattered huckleberry shrub. Downed logs and small trees are present from past logging operations. Willow (*Salix* spp.) and Sitka alder scrub-shrub wetland are present in the survey area along a portion of Silver Creek.

One liverwort species listed as a Survey and Manage species for California, *Ptilidium californicum*, was observed in the SUP area. The survey protocol for this species recognizes its widespread occurrence in Washington, and it is a species of concern only for northern California (USFS and USBLM 1997). The USFS and USBLM also recognize its listing as a Survey and Manage species only for California in the 2001 Record of Decision for amendments to the Survey and Manage species (USFS and USBLM 2001).

Surveys for the Survey and Manage moss species with predisturbance survey protocol (USFS and USBLM 2001), *Schistostega pennata* and *Tetraphis geniculata*, were conducted in proposed

project areas within mature open and closed canopy forest, including forests dominated by Pacific silver fir, mountain hemlock, and subalpine fir. In addition, moss surveys were conducted in some project areas where immature forest is dominant although larger, more mature trees are occasionally present and larger old stumps, downed logs, and overturned tree roots (root wads) are found on the forest floor. Target survey areas included cool, moist sites with decaying wood and shaded mineral soil associated with the undersurface of tree root wads. Common understory species throughout most of these forests include *Vaccinium* species and rhododendron (*Rhododendron albiflorum*) along with dwarf bramble (*Rubus lasiococcus*) under a more closed canopy and woodrush (*Luzula hitchcockii*) in the more open canopy mature subalpine fir forests. These survey areas include the following proposed MDP project areas:

- Park 'n Ride Lift and ski trail (MDP Trail 12A),
- Lower switchback off MDP Trail 13B,
- Kelly's Gap Express chairlift, below 4,800 feet and above 5,500 feet,
- Alpine Inn addition,
- MDP Parking Lots G, H, I, and J,
- Quicksilver Express extension (MDP Trail 4B) and small section along lower west side of Trail 4D,
- Morning Glory Express chairlift and above Gun Tower (MDP Trails 13E, 14A, 14B, 14C),
- East Peak upper and lower chairlift terminals (MDP 16A) and cross-over trail (MDP Trail 15F),
- Silver Basin Egress trail,
- Silver King MDP Trails 5A and 5B,
- roadway from base of High Campbell chairlift (Chair 2) to proposed lagoon in Avalanche Basin,
- MDP Trail 13F,
- Snorting Elk chairlift (MDP Trails 2C, 2F, 14F, 14G, 14H).

No Survey and Manage moss species with approved protocol for predisturbance surveys were observed in these proposed project areas.

Rhizomnium nudum, was considered a Survey and Manage moss species during the time field surveys were initially conducted in 1998. It was observed in the forest where Trails 12A and 15F are proposed. The species was located in the proposed trail locations and in the forested

area beyond the proposed Trail 12A. Additional surveys for this species were conducted during 2002 in the SUP area when the species was still considered a Survey and Manage species. *R. nudum* was observed in various sites across the SUP area outside of proposed MDP project sites. Records of where the surveys occurred and where *R. nudum* was located are on file with the MBSNF. *R. nudum* is a relatively widespread species that is fairly common in alpine and subalpine areas on the MBSNF (Harpel pers. comm.). As previously mentioned, *R. nudum* was removed from the Survey and Manage list during the annual review for Survey and Manage species (USFS and USBLM 2003).

4.2.3.2 Lichens

Surveys for the Survey and Manage lichen species *Hypogymnia duplicata*, *Pseudocyphellaria rainierensis*, and *Lobaria linia* were conducted in proposed project areas within mature forest. Other surveys were conducted in project areas within immature forest where larger trees are occasionally present and scattered throughout the forest. Surveys for *Tholurna dissimilis* were conducted above an elevation of 6,760 feet at the time this species was still considered a Survey and Manage species. Survey areas included trees located around the Summit House, Summit Retreat Center, and along the proposed alpine interpretive trail around the Summit House area.

No Survey and Manage lichen species were observed in the proposed project areas. The previously documented occurrence of *Tholurna dissimilis* as described earlier was based on this species' previous listing as a Survey and Manage species. Lichen species commonly observed in the hemlock and fir dominated forests include *Hypogymnia enteromorpha*, *Hypogymnia occidentalis*, *Hypogymnia* sp., *Peltigra* sp., *Platismatia glauca*, and *Platismatia* sp. (based on descriptions in McCune and Geiser 1997).

Specific survey areas in mature and immature forest are described below.

Proposed Projects in Mature Forest

As recommended in the survey protocol for Survey and Manage lichen species, a brief description of the forest conditions in the survey area is provided below.

Quicksilver Chairlift Realignment and Trail 4B Widening. No Survey and Manage lichen species were observed in the proposed chairlift alignment or the proposed Trail 4B project area as presented in the MDP (i.e., widening/enhancing the existing Boondoggle ski trail). Forest conditions in this proposed project area are dominated by mature western hemlock and Pacific silver fir from approximately 4,600 feet to 5,000 feet and Pacific silver fir and mountain hemlock from 5,000 feet to 5,400 feet. Canopy tree sizes generally range from approximately 18 to 24 inches dbh (a few trees are present that are approximately 36 inches dbh), with mid-story trees ranging from 8 to 14 inches dbh. Understory vegetation is generally sparse with shrubs such as *Vaccinium* species and occasional rhododendron (*Rhododendron albiflorum*) present; woodrush (*Luzula* spp.), fiveleaved bramble (*Rubus pedatus*), and dwarf bramble (*R. lasiococcus*) are present as ground cover.

Silver Basin Egress Trail. No Survey and Manage lichen species were observed in the proposed alignment for the Silver Basin egress trail. The proposed trail as flagged in the field (and as presented in the MDP) and other areas surrounding the trail alignment were surveyed in

the field. Forest conditions in this area are mature forest dominated by Pacific silver fir and mountain hemlock (as described above for the Quicksilver Trail realignment) and subalpine fir. Subalpine fir is the common species above an elevation of approximately 5,500 feet. Mature subalpine fir forest in the proposed project area consists of an open canopy, trees approximately 12 to 18 inches dbh, and understory vegetation consisting of scattered *Vaccinium* spp. (including *V. alaskense*, *V. scoparium* and *V. deliciossum*), and woodrush (*Luzula hitchcockii*).

North Country. No Survey and Manage lichen species were observed in mature forest in the proposed ski trails or lift alignment associated with the proposed Morning Glory chairlift. Mature forest within proposed project areas include those dominated by Pacific silver fir or subalpine fir with open canopies. Mature subalpine fir forest is dominated by trees up to approximately 18 inches dbh; mature Pacific silver fir are generally 18 to 28 inches dbh with an understory of *Vaccinium membranaceum*.

Discovery Chairlift. In addition to the proposed project areas described above, mature forest dominated by western hemlock with Douglas fir and Pacific silver fir was surveyed in an area west of the proposed realignment and trail improvements associated with the Discovery chairlift. Larger trees were generally 28 to 32 inches dbh; smaller subalpine fir trees in the area were 12 to 18 inches dbh. Although the area surveyed is outside of the proposed project areas, this small area was surveyed to increase the database knowledge of Survey and Manage lichen species in potential habitat. No Survey and Manage lichen species were observed in this area.

Summit House Expansion and Retreat Center. As reported in the USFS database, *Tholurna dissimilis* has been documented to occur near the Crystal Mountain Summit House. This species' presence was confirmed during field surveys conducted by USFS and Jones & Stokes botanists. However, since the database search and field surveys were conducted, this species is no longer considered a Survey and Manage species by the USFS and USBLM north of the Columbia River and has been removed from the Survey and Manage list in this region. (USFS and USBLM 2001).

Parking Lots I and J. No Survey and Manage lichen species were observed in mature forest where Parking Lots I and J are proposed. Pacific silver fir is the dominant mature tree, although western hemlock and scattered noble fir are also present in this forested area. Pole size trees are present in the understory and the shrub layer is generally sparsely vegetated with *Vaccinium* species.

Proposed Projects in Areas Not Dominated by Mature Forest

In addition to conducting surveys in mature forests, lichen surveys were also conducted in some project areas where immature forest is dominant although larger, more mature trees are occasionally present in the forest. These survey areas include:

- base area facilities (e.g., parking lots, employee housing, wastewater treatment plant),
- Kelly's Gap chairlift,
- Park 'N Ride Lift and ski trail (MDP Trail 12A),

- MDP ski Trails 13F and 13H, and
- East Peak lower chairlift terminal and cross-over trail (MDP Trail 15F).

No Survey and Manage lichen species were observed in these proposed project areas.

Forest conditions in these areas are dominated by western hemlock and Pacific silver fir with Douglas-fir becoming more common on west facing slopes. The trees are closely spaced, creating a generally closed canopy condition; understory is usually sparse with scattered *Vaccinium* species. Trees generally range in size from 6 to 18 inches, with larger trees up to 24 inches present in some areas (occurrence of larger trees ranges from approximately 1 to 5 trees per acre). Mixed conifer forests of Pacific silver fir, subalpine fir, Douglas-fir, and western hemlock occur on the east facing slopes above Crystal Mountain Boulevard where Trails 13F and 13H are proposed.

A remnant patch of mature western hemlock and Douglas-fir slightly over an acre in size is present near the proposed lower terminal of East Peak chairlift. Mature trees generally range in size from 20 to 36 inches dbh at a density of approximately 15 trees per acre. The open nature of the large trees supports a dense stand of Pacific silver fir (4 to 16 inches dbh) and sparsely scattered *Vaccinium* species.

4.2.3.3 Fungi

Known sites of *Bridgeoporus nobilissimus* in Washington and Oregon occur in lower elevations below 4,000 feet (Hibler and O'Dell 1998). In the Crystal Mountain SUP area, noble fir is present as a subdominant in Pacific Silver fir forest on east facing slopes between approximately 3,900 and 5,000 feet. No occurrences of *Bridgeoporus nobilissimus* were recorded by botanists during surveys for vascular and nonvascular plants throughout the Crystal Mountain ski area.

Surveys for *Sarcosoma mexicana* were conducted during the spring and summer of 2000 as snow melted away from the majority of the proposed project areas at the base and in the higher elevations. Surveys were repeated three times per protocol requirements (O'Dell 1999). Survey areas included proposed projects in all mature forest habitats (Trail 13E; Trails 14A, B, C; Trails 4A, B; Trail 15F; Quicksilver Chairlift Extension; Kelly's Gap Express; Parking Lots I and J; and Silver Basin Egress). Surveys were also conducted in proposed project areas in immature forest (Trails 4B, 15A-G, 12A, 12B, 13B, 13F; Parking Lots G and H; Kelly's Gap Express; wastewater treatment plant; employee housing; and Alpine Inn expansion). Vegetation conditions in these mature and immature forests are similar to conditions previously described for other species. Surveys were conducted following survey protocol developed by the USFS and USBLM (O'Dell, 1999). Survey protocol for *S. mexicana* has since changed (USFS and USBLM 2001) and predisturbance surveys are no longer required. No *S. mexicana* or *S. latahensis* species were observed. A dark colored mushroom that looks similar to the *Sarcosoma* species was found throughout the base area. This species was identified as *Pseudoplectania melaena*.

5 DETERMINATION OF EFFECTS ON SENSITIVE AND SURVEY AND MANAGE PLANT SPECIES

5.1 Discussion of Effects for Project Areas

The proposed action could result in direct impacts on *Pedicularis rainierensis*. The known occurrence of *Tholurna dissimilis* would be avoided during the Summit House expansion and construction of the Summit Retreat Center. Indirect impacts from construction could be avoided if mitigation measures are implemented as described later.

The potential effects of the proposed projects on *Pedicularis rainierensis* and *Tholurna dissimilis* are discussed below. The rationale for the determination of effects follows the discussion of measures to reduce potential project impacts. *Rhizomnium nudum* is no longer considered a special-status species because it has been removed from the Survey and Manage species list in Washington (USFS and USBLM 2003). Surveys conducted before the species was removed from the list indicate two locations of *R. nudum* would be affected by proposed MDP projects, while other locations of *R. nudum* observed within the SUP area would not be affected.

5.1.1 Potential Impacts on *Pedicularis rainierensis*

Proposed MDP projects that could impact *Pedicularis rainierensis* include:

- Silver King chairlift: The proposed corridor runs through several locations of approximately 320 individual plants. The lower terminal is located near a separate population of approximately 200 individual plants but avoids the area where the plants are located.
- Trail 5B (Avalanche Basin): The proposed trail clearing area runs through an occurrence of approximately 50 individual plants.
- Snorting Elk chairlift: The proposed lower terminal occurs in a portion of a known location of plants totaling approximately 232 individual plants. The proposed lift corridor also skirts the edge of this location of plants.
- Green Valley restaurant sewer line: The proposed sewer line connecting the restaurant to the Green Valley drainfield runs through one large area of several thousand plants.
- Trail 13E (downslope of Gun Tower Ridge in the North Country): One location of approximately 4,000 plants occurs immediately adjacent to the proposed clearing where Trail 13 E switchbacks at an elevation of 5,900 feet.

Each of these project areas is discussed below. Overall, the proposed MDP projects are not expected to result in a significant impact on the viability of *Pedicularis rainierensis* in the SUP area.

5.1.1.1 Silver King Chairlift

Impact mechanisms that could affect *Pedicularis rainierensis* are direct disturbance from soil and ground disturbance to construct chairlift tower footings, the lower terminal, or disturbance from removal of forest vegetation. Construction of the chairlift could affect a small percentage of the plants if a tower is placed within the area where the location of plants occurs or if the removal of forest vegetation is required for the lift corridor clearance. The plants are scattered in an area approximately 900 feet long and 100 feet wide. The exact placement of towers and lift corridor has not yet been determined. Loss of plants would occur if the construction footprint for a tower footing is located where some of the individual plants are growing. Loss of plants could also occur if subalpine fir trees are cleared and removed by dragging over the soil surface during a time when aboveground portions of the plants are present. Recontouring is not proposed for this area, and surface and subsurface soils are expected to remain in place if removal of trees is required. Trees would be flush cut, and stumps would be left in the ground.

Tree removal would occur in a stand of subalpine fir located adjacent to the natural opening where the *Pedicularis rainierensis* occurs. Therefore, the likelihood of plants being disturbed from tree removal is minimal. Plants that are disturbed by breaking or removing aboveground plant material from tree removal would not necessarily result in a permanent loss. *Pedicularis rainierensis* is a perennial forb, and depending on the extent of damage to the aboveground shoots, the plant could remain viable for growth later in the growing season or the next year. Plants pulled partially or completely out of the ground exposing root material would likely die.

The actual number of plants that would be lost cannot be determined because, although groups of plants were mapped, individual plant locations were not mapped, engineering details are not finalized for the chairlift construction, and plant population numbers can change from year to year.

It is possible all plants could be avoided if chairlift towers and the lower terminal (and associated regrading) can be placed away from plants, and if trees are felled in a direction away from the population of plants. Footprints for tower footings are relatively small (approximately 100-200 square feet) and could be placed to avoid and reduce impacts on individual plants. The proposed chairlift alignment skirts the edge of a clump of subalpine fir trees, and the number of trees that will be required to be removed for corridor clearance would be minimal. Disturbance to plants by tree removal could be minimized by leaving trees in place or sliding them through areas where *Pedicularis rainierensis* is not present. Other general construction measures that could be taken to avoid and reduce impacts are discussed later.

Given the small size of the tower footings and minimal clearance of trees, it is anticipated the majority of the plants in this location would not be disturbed by the project.

5.1.1.2 Trail 5B (Avalanche Basin)

Two locations of *Pedicularis rainierensis* totaling approximately 50 plants occur within the proposed trail clearing area. As discussed above for the Silver King chairlift, the exact number of plants that may be affected would be determined based on which trees would be removed and whether the trees would be removed by dragging across existing plants, or if the trees would be

left in place. Recontouring would not occur at this site, and soil disturbance would not occur unless trees are dragged across the ground surface. In a worst-case situation, most plants in these two locations could be lost if trees are cut and dragged over the populations, pulling out the plants' roots. Methods to avoid impacts associated with tree removal are discussed later.

5.1.1.3 Snorting Elk Chairlift

Potential impacts on *Pedicularis rainierensis* would be similar to those described for the Silver King chairlift. The location of the proposed lower Snorting Elk terminal occurs in an area where plants were mapped during the 1997 field season. The proposed chairlift alignment and associated regrading with the lower terminal overlap a portion of the area where the individual plants occur. Construction of the lower terminal would likely remove plants during construction activities. Although the specific number of plants that could be affected is not known at this time, it is estimated approximately half of the plants could be affected by construction of the lower terminal. Measures to avoid and reduce impacts on the plants are discussed later.

5.1.1.4 Green Valley Restaurant Sewer Line

Connecting the proposed Green Valley restaurant sewer line to the Green Valley drainfield would require installing the sewer line through a large location of *Pedicularis rainierensis* estimated to contain several thousand plants. The construction corridor would be approximately 10 feet wide and extend for approximately 250 feet through the area where the plants occur. Installation of the line would require using a small backhoe to dig a 1-foot-wide trench for the sewer line. Plants removed for the trench would likely be killed and other plants could be trampled or crushed during construction activities. Installation of the line would not represent a permanent loss of habitat since the surface and subsurface soil layers would be replaced. Onsite identification of the route alignment would be done to help minimize the number of plants that would potentially be disturbed by the construction. The sewer line construction would potentially disturb only a very small percentage of the plants, because of the large number of plants in the location and the dispersed nature of individual plants. The exact number of plants that would be affected is not known because individual plant locations were not mapped.

5.1.1.5 Trail 13E (Trail Off Gun Tower Ridge in the North Country)

Approximately 4,000 plants of *Pedicularis rainierensis* occur immediately adjacent to and north of the forested area that would be cleared at the switchback of Trail 13E. The plants occur in the nonforested, herbaceous covered slopes north of the area proposed to be cleared for the ski trails at an elevation of approximately 5,900 feet. Impacts to the plants could occur if construction equipment used for removing trees drives over plants or if cut trees are dragged over the plants. Based on the distribution of the plants in this area and the location of the trail clearing, it is estimated less than 5% of the population could be affected by the project. Measures to avoid and reduce impacts are discussed later.

5.1.2 Potential Impacts on *Tholurna dissimilis*

Although *Tholurna dissimilis* has been removed from the Survey and Manage species list for Washington, the Summit House expansion would still be designed and constructed to ensure those trees identified as supporting *T. dissimilis* would not be removed. The following construction limits were identified to avoid the host trees supporting the lichen: construction of the Summit House would utilize the existing building footprint with expansion onto the existing cleared area that is currently used for picnic tables, and on the east side of the hydrologic divide along the crest. Locating a staging area, and activities that occur in staging areas, would not be expected to impact the lichen species because sparsely vegetated areas west of the Summit House could be used for storing and handling equipment and supplies.

To avoid the lichen, the proposed retreat center would be constructed 25 to 50 feet north of the television building site. Final designs for the Summit House and Summit Retreat Center would be reviewed by a USFS botanist to ensure the building footprint avoids trees supporting *T. dissimilis*.

Indirect impacts on *T. dissimilis* could occur if excessive dust is generated and not controlled on the site or if rocks and boulders are allowed to roll downslope and bounce into trees supporting lichen. Construction activities that generate an excessive amount of dust that completely coats the lichen could reduce the reproductive potential, photosynthesis, or other biochemical processes that occur in plants. Measures to avoid and reduce impacts are discussed later.

The proposed summit interpretive trail and alpine garden would not affect *T. dissimilis* because the trail alignment could be placed in an area that would not result in the removal of trees supporting the lichen.

5.2 Measures to Avoid, Minimize, and Reduce Impacts

To ensure that construction-related impacts on the known locations of *Pedicularis rainierensis* and *Tholurna dissimilis* are minimized to the fullest extent possible, the measures discussed below should be implemented:

- A botanist familiar with the locations of *Pedicularis rainierensis* and *Tholurna dissimilis* would place flagging or construction fence around the known locations and beyond the drip line of the trees before construction begins.
- A preconstruction field meeting with the construction manager, Crystal Mountain, the USFS, and a botanical monitor would occur. The meeting would identify the locations of the plants, describe the type of flagging or fencing used to mark the area, and describe the construction crew's responsibility to minimize the amount of work that occurs in the flagged areas. If areas within the flagged zones cannot be avoided, the construction manager, USFS, Crystal Mountain, and the botanical monitor would discuss where work would occur, the type of activity, and when the activity would occur.
- During construction, a botanical monitor would be available to visit the site to ensure the sensitive plants are being avoided to the extent possible.

- After construction is complete, including implementation of erosion control features if required, the flagging marking the sensitive plant locations would be removed.
- Areas where down trees could be left in place to avoid disturbance to herbaceous vegetation would be identified. Where possible (based on slope, snow levels, construction timing), trees would be removed from the site over snow to reduce impacts on herbaceous vegetation. (This measure applies to *Pedicularis rainierensis*.)
- Staging areas or temporary placement of spoil piles, debris piles, and similar construction-related facilities would be established away from sensitive plant locations.
- Construction equipment required to install towers would utilize existing roads or would be lifted to steep slope sites by helicopter.
- Draft engineering drawings would be reviewed by the USFS to determine if proposed locations of towers and other facilities occur in a sensitive plant (*Pedicularis rainierensis*) location. The USFS and Crystal Mountain would determine if relocation of the tower to avoid or reduce impacts is feasible from an engineering perspective.
- Water would be available to spray the ground and construction area at the Summit House to effectively reduce the dispersal of dust. Final design drawings for the Summit House expansion and Summit Retreat Center would be reviewed by a botanist to ensure trees are avoided which support *Tholurna dissimilis*.

5.2.1 Rationale for Determination of Effects

The proposed action is not expected to result in a significant impact on *Pedicularis rainierensis* for the following reasons:

- Permanent loss of plants and potential habitat would occur only where towers and terminals would be placed. The maximum number of towers in the sensitive plant areas would be two to four towers. The area required for one tower footing is small (approximately 200 square feet).
- The majority of the potential impact area is related to the removal of trees, which does not result in a permanent loss of habitat because surface soil is left in place and soil horizons are undisturbed.
- Over 90% of the individual plants known to occur in the SUP area are not expected to be affected by the development of the proposed projects.

The MDP avoids the majority of *Pedicularis rainierensis* plants and over 10,000 plants would not be affected by the project. Use of measures described above will further reduce impacts. Avoidance of direct impacts on the plants and implementation of the measures described above would ensure the viability of *Pedicularis rainierensis* in the SUP area.

Construction of the Summit House expansion and Summit Retreat Center would avoid impacts on *Tholurna dissimilis* and would not affect the viability of the species.

6 CITATIONS

6.1 Printed References

Franklin, J.F., and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. Oregon State University Press. Corvallis, OR.

Hibler, C., and T.E. O'Dell. 1998. Survey protocols for *Bridgeoporus* (= *Oxyporus*) *nobilissimus* (W.B. Cooke) Volk, Burdsall, & Ammirati. Fungi. Version 2.0. Prepared for the United States Forest Service, R-6 and Bureau of Land Management OR/WA/CA. Portland, OR.

Jones & Stokes Associates. 1997. Silver Creek watershed condition assessment. Volumes I and II. Bellevue, WA. Prepared for U.S. Forest Service/Mt. Baker-Snoqualmie National Forest and Crystal Mountain, Inc. Mountlake Terrace, WA and Crystal Mountain, WA.

McCune, B., and L. Geiser. 1997. Macrolichens of the Pacific Northwest. Oregon State University Press. Corvallis, OR.

O'Dell, T.E. 1999. Survey protocols for seven protection buffer fungi. Version 1.3. December 9, 1999. Prepared for U.S. Forest Service and U.S. Bureau of Land Management. Portland, OR.

Sno.engineering. 1998. Crystal Mountain master development plan. Bellevue, WA. Prepared for Crystal Mountain, Inc., Crystal Mountain, WA.

U.S. Department of Agriculture and U.S. Department of Interior. 2002. REO review of the Mount Baker Snoqualmie National Forest identification of occasional sites not needed for persistence - Crystal Mountain Special Use Permit Area. (Reply To: 1950(FS)/1736 PFP (BLM) (OR-935).) December 20. Portland, OR.

U.S. Forest Service. 1999. Sensitive species plant list, Region 6 U.S. Forest Service. April 1999. U.S. Forest Service, Pacific Northwest Region. Portland, OR.

U.S. Forest Service and U.S. Bureau of Land Management. 1994. Record of Decision and Final Environmental Impact Statement for the management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, OR.

U.S. Forest Service and U.S. Bureau of Land Management. 1997. Survey protocols for survey and manage component 2 bryophytes. Version 2.0. December 11, 1997. Portland, OR.

U.S. Forest Service and U.S. Bureau of Land Management. 1998. Survey protocols for component 2 lichens. Version 2.0. March 12, 1998. Portland, OR.

U.S. Forest Service and U.S. Bureau of Land Management. 1999a. Survey protocols for protection buffer bryophytes. Version 2.0. December 3, 1999. Portland, OR.

U.S. Forest Service and U.S. Bureau of Land Management. 1999b. Draft – supplemental environmental impact statement for amendment to the survey and manage, protection buffer, and other mitigating measures standards and guidelines. Portland, OR.

U.S. Forest Service and U.S. Bureau of Land Management. 2000. Final – supplemental environmental impact statement for amendment to the survey and manage, protection buffer, and other mitigation measures standards and guidelines. Portland, OR.

U.S. Forest Service and U.S. Bureau of Land Management. 2001. Record of Decision and standards and guidelines for amendments to the survey and manage, protection buffer, and other mitigation measures standards and guidelines. Portland, OR.

U.S. Forest Service and U.S. Bureau of Land Management. 2002. Implementation of 2001 Survey and Manage annual species review. (BLM Instruction Memorandum No. OR-2-2-064.) June 14.

U.S. Forest Service and U.S. Bureau of Land Management. 2003. Implementation of 2002 Survey and Manage Annual Species Review. (BLM-Instruction Memorandum No. OR-2003-050). March 14, 2003

Whiteaker, L., et al. 1998. Survey protocols for Survey and Manage strategy 2 vascular plants. Version 2.0. Prepared for the United States Forest Service, R-6 and Bureau of Land Management OR/WA/CA. Portland, OR.

6.2 Personal Communications

Harpel, Judy. Bryologist. Region 6 USFS, Portland, OR. July 27, 1999 – meeting with L. Potash; November 9, 1999 – telephone conversation with L. Potash.

Lescher, Robin. MBSNF forest ecologist. June 22, 1997 - field meeting regarding potential habitat for survey and manage lichen species at Crystal Mountain ski area.

Potash, Laura. MBSNF botanist. December 1997 – memo on recommendations for survey and manage implementation in FY 1998 for vascular plants and non-vascular cryptogams on the Mt. Baker-Snoqualmie NF; June 11, 1998 – meeting regarding potential habitat and survey requirements for survey and manage lichen species at Crystal Mountain ski area; September 23, 1998 - letter describing survey requirements for Survey and Manage liverwort species; November 2, 1998 – telephone conversation regarding survey requirements for Survey and Manage liverwort species.

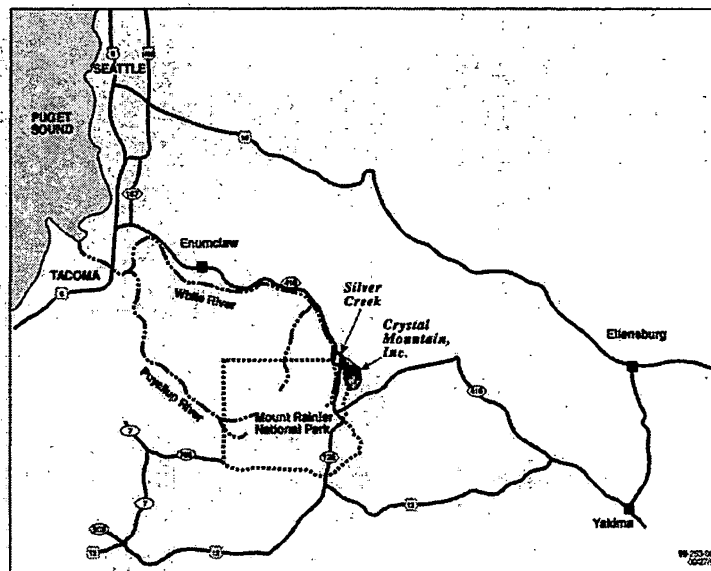


Figure 1. Vicinity Map, Crystal Mountain, Inc.

Appendix A
List of Species Identified by Bryologist

List of Bryophytes Collected at Sites of Proposed Ski Trail Modifications at Crystal Mountain

11/05/98

Site #1 Bullion Basin Seep. ca. 4700'

Liverworts:

Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dum.
Conocephalum conicum (L.) Lindb.
Jungermannia exsertifolia Steph.
Lophozia wenzelii (Nees) Steph.
Marchantia sp.
Pellia endiviifolia (Dickson) Dum.
Scapania bolanderi Aust.

Mosses:

Bartramia halleriana Hedw.
Brachythecium frigidum (C. Müll.) Besch.
Eurhynchium praelongum (Hedw.) Schimp. in B.S.G.
Hypnum praetense (Rabenh.) W. Koch ex Spruce
Hypnum subimponens Lesq.
Plagiomnium insignae (Mitt.) T. Kop.
Pohlia cruda (Hedw.) Lindb.
Pohlia wahlenbergii (Web. & Mohr) Andrews
Pohlia sp.
Rhizomnium magnifolium (Horik.) T. Kop.
Timmia austriaca Hedw.

Site #2 Bullion Basin. Seasonal stream area. ca. 4800'

The ground at this site was covered in snow, and so only a few bryophytes were visible along the margin of the stream.

Liverworts:

Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dum.
Lophozia guttulata (Lindb. et H. Arnell) Evans
Marchantia sp.

Mosses:

Bryum lissae De Not. var. *cuspidatum* (Bruch & Schimp. in B.S.G.) Marg.
Bryum pseudotriquetrum (Hedw.) Gaertn. et al.
Ceratodon purpureus (Hedw.) Brid.
Dichodontium pellucidum (Hedw.) Schimp.
Dicranum fuscescens Turb.
Dicranum tauricum Sapp.
Eurhynchium praelongum (Hedw.) Schimp. in B.S.G.
Hypnum lindbergii Mitt.
Plagiomnium insignae (Mitt.) T. Kop.
Plagiomnium rostratum (Schrad.) T. Kop.
Pohlia sp.

List of Bryophytes Collected at Sites of Proposed Ski Trail Modifications at Crystal Mountain

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Polytrichum juniperinum Hedw.
Rhytidiopsis robusta (Hook.) Broth.

Site #3 Bullion Basin. Proposed ski trail through the forest. ca. 4700'--4800'

Liverworts:

Barbilophozia floerkei (Web. et Mohr) Loeske
Blepharostoma trichophyllum (L.) Dum.
Calypogeia fissa (L.) Raddi
Calypogeia muelleriana (Schiffn.) K. Müll.
Cephalozia lunulifolia (Dum.) Dum.
Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dum.
Lophozia guttulata (Lindb. et H. Arnell) Evans
Lophozia incisa (Schrad.) Dum.
Plagiochila asplenoides (L.) Dum.
Ptilidium californicum (Aust.) Underwood
Riccardia latifrons Lindb.
Scapania bolanderi Aust.
Scapania undulata (L.) Dum.

Mosses:

Dicranum fuscescens Turp.
Dicranum scoparium Hedw.
Dicranum tauricum Saph.
Eurhynchium praelongum (Hedw.) Schimp. in B.S.G.
Hylocomium splendens (Hedw.) Schimp. in B.S.G.
Hypnum lindbergii Mitt.
Hypnum praetense (Rabenh.) W. Koch ex Spruce
Plagiothecium laetum Schimp. in B.S.G.
Racomitrium ericoides (Web. ex Brid.) Brid.
Rhizomnium nudum (Bitt. & Williams) T. Kop.
Rhytidiopsis robusta (Hook.) Broth.

Site #4 Trail 12 A West Side. Proposed ski trail through forest. ca. 4400'

Liverworts:

Blepharostoma trichophyllum (L.) Dum.
Calypogeia fissa (L.) Raddi
Cephalozia lunulifolia (Dum.) Dum.
Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dum.
Conocephalum conicum (L.) Lindb.
Jungermannia exsertifolia Steph.
Lepidozia reptans (L.) Dum.
Lophocolea heterophylla (Schrad.) Dum.
Lophozia guttulata (Lindb. et H. Arnell) Evans
Lophozia incisa (Schrad.) Dum.

List of Bryophytes Collected at Sites of Proposed Ski Trail Modifications at Crystal Mountain

11/05/98

Marchantia sp.
Pellia neesiana (Gott.) Limpr.
Plagiochila asplenoides (L.) Dum.
Riccardia latifrons Lindb.
Riccardia multifida (L.) S.Gray
Scapania bolanderi Ausl.
Scapania umbrosa (Schrad.) Dum.
Scapania sp.

Mosses:

Brachythecium frigidum (C. Mull.) Besch.
Buxbaumia piperi Best
Claopodium whippleanum (Sull. in Whipple & Ives) Ren. & Cardl.
Dicranum fuscescens Turn.
Dicranum tauricum Saph.
Eurhynchium praelongum (Hedw.) Schimp. in B.S.G.
Hypnum circinale Hook.
Mnium spinosum (Voit) Schwaegr.
Plagiommium insigne (Mitt.) T. Kop.
Plagiothecium laetum Schimp. in B.S.G.
Pohlia sp.
Polytrichum formosum Hedw.
Polytrichum juniperinum Hedw.
Rhizomnium nudum (Britt. & Williams) T. Kop.
Rhytidiopsis robusta (Hook.) Broth.